How social changes altered the Germanic past tense system. An agent-based simulation

The Germanic past tense system is reliant upon two general morphological strategies. The first strategy is called the strong inflection, and switches the vowel of the verb's stem, as in *sing* ∼ *sang* and *drive* ∼ *drove*. The second strategy is contrastively called the weak inflection, and adds a dental suffix to the stem, as in *kick* ∼ *kicked* (Harbert 2007). This second strategy has been pushing aside the first over the course of thousands of years. The causes for this growing supremacy of the weak inflection are generally sought in the strong inflection's ostensible irregular nature – to the point where it is often equated with 'irregular inflection' (Lieberman et al. 2007) – and the weak inflection's frequency dominance (Carroll et al. 2012; Cuskley et al. 2014). However, neither were the case in the earliest stages of the Germanic language, and therefore, they cannot explain the initial success of the weak suffix (Ball 1968, p. 164; Bailey 1997, p. 7-8).

What we propose instead, is that the weak inflection owes its initial rise to its property of general applicability, i.e. its ability to be, in principle, applicable to any verb (Pijpops, Beuls, and Van de Velde 2015). In contrast, each individual strong ablaut class is only applicable to a subset of verbs. Under certain social conditions, this evolutionary advantage may be more decisive than the advantages of the strong inflection, e.g. its shorter verb forms. In order to investigate this, we have composed an agent-based simulation. In this simulation, the strong inflection maintains its original regularity, being composed out of several transparent ablaut classes, and initially dominates the entire verbal paradigm.

Still, the results show that given certain social changes, most notably in cases of demographic turmoil and a rapid replacement of the population, the weak inflection may turn the table on the strong inflection. In addition, this rise of the weak inflection in the simulation is accompanied by a Conserving Effect (Bybee 2006). That is, the weak suffix can be shown to take over the low frequency verbs before moving on to the high frequency verbs. Under conditions less favorable to the weak inflection, these high frequency verbs are in fact capable of maintaining their strong forms indefinitely, and a stable equilibrium may evolve. That is, a dual system may develop in which strong and weak each occupy their own niche. Finally, we find an effect of Class Resilience. That is, particular strong ablaut classes seem better capable of protecting even their low frequency verbs against the rise of the weak inflection, while other classes wither away. All of these effects, which we also find in corpus data (Carroll et al. 2012), can be found to emerge merely as a result of the weak inflection's general applicability and demographic changes.

References

Christopher Gordon Bailey. *The Etymology of the Old High German Weak Verb*. PhD thesis, University of Newcastle upon Tyne, 1997.

Christopher Ball. The Germanic dental preterite. *Transactions of the Philological Society*, 67:162–188, 1968.

Joan Bybee. From Usage to Grammar: The Mind's Response to Repetition. *Language*, 82(4):711–733, 2006. ISSN 00978507.

Ryan Carroll, Ragnar Svare, and Joseph Salmons. Quantifying the evolutionary dynamics of German verbs. *Journal of Historical Linguistics*, 2(2):153–172, 2012.

Christine Cuskley, Martina Pugliese, Claudio Castellano, Frascesca Colaiori, Vittorio Loreto, and Franscesca Tria. Internal and External Dynamics in Language: Evidence from Verb Regularity in a Historical Corpus of English. *Plos One*, 9(8): e102882, 2014.

Wayne Harbert. *The Germanic languages*. Cambridge university press, Cambridge, 2007.

Erez Lieberman, Jean-Baptste Michel, Joe Jackson, Tina Tang, and Martin Nowak. Quantifying the evolutionary dynamics of language. *Nature*, 449(7163):713–716, 2007. ISSN 0028-0836.

Dirk Pijpops, Katrien Beuls, and Freek Van de Velde. The rise of the verbal weak inflection in Germanic. An agent-based model. *Computational linguistics in the Netherlands Journal*, 5:81–102, 2015.